



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|------------------------------------|-------------|----------------------|---------------------|------------------|
| 10/694,814 | 10/29/2003 | Joon-Seop Kwak | 030681-590 | 4551 |
| 21839 | 7590 | 03/23/2005 | EXAMINER | |
| BURNS DOANE SWECKER & MATHIS L L P | | | DANG, TRUNG Q | |
| POST OFFICE BOX 1404 | | | ART UNIT | |
| ALEXANDRIA, VA 22313-1404 | | | PAPER NUMBER | |
| | | | 2823 | |

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/694,814 | KWAK, JOON-SEOP | |
| | Examiner | Art Unit | |
| | Trung Dang | 2823 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application-No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>2/22/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rennie (U.S. Pat. 6,057,564) in view of Okumura (U.S. Pat. 6,370,176).

The rejection is maintained as of record and is repeated herein.

With reference to Fig. 7, Rennie teaches method for manufacturing a light emitting device comprising the steps of:

forming at least one layer of n-type compound semiconductor layer (layer 2 and 4) on a substrate (1);

forming an active layer (6) on the n-type compound semiconductor layer, the active layer where light is generated;

forming at least one layer of p-type compound semiconductor layer (layer 7, 8, and 9) on the active layer (6);

thermally treating the resultant structure in an oxygen ambient to form an oxide layer (30) on the p-type compound semiconductor layer (9) so as to obtain a low resistance ohmic contact (see col. 2, lines 3-21; col. 6, lines 54-60; col. 7, lines 49-52);

forming a p-type electrode (11) on the p-type compound semiconductor layer (9); and
forming an n-type electrode (3) to contact the n-type compound semiconductor layer (2).

Noted that, the thermally treating the resultant structure in an oxygen ambient disclosed in the reference reads on the claimed second annealing because annealing involves a heat treatment of the structure. Also, see col. 2, lines 26-29 for a teaching of a p-type electrode comprises metal selected from the group consisting of Ni, Pd, Au and Pt or an alloy thereof, hence the claimed limitations of claims 5-7, 10, 17-19, and 22 concerning a p-type electrode is formed as a single layer or a multi layer of Pd, Ni, Pt, or Au are met by the reference.

Rennie differs from the claims in not disclosing the claimed first annealing in nitrogen atmosphere.

Okumura teaches a method for forming a GaN group semiconductor laser device having a structure depicted in Fig.1 in which, prior to forming a p-type electrode (12), the p-type GaN layer (11) is annealed in a nitrogen atmosphere to reduce the resistance of the layer (col. 8, lines 44-46).

It would have been obvious to one of ordinary skill in the art to modify Rennie's teaching by annealing the p-type GaN contact layer (9) in Fig. 7 after it is formed in a nitrogen atmosphere as suggested by Okumura for the benefit of reducing the resistance of the p-type GaN contact layer (9). Noted that this annealing in nitrogen atmosphere reads on the claimed first annealing. Thus, the combined teaching results in the p-type GaN contact layer (9) in Fig. 7 is annealed twice, one in nitrogen atmosphere to reduce the resistance and the other in oxygen atmosphere to obtain a low resistance ohmic contact with the p-type electrode (11).

As for claims 3-4, 15-16, see Okumura col. 8, line 45 for the temperature at which the first annealing is performed and Rennie col.7, line 49 the temperature at which the second annealing is performed. Although Okumura and Rennie are silent about the annealing durations as claimed, it is well settled that, absent a showing of criticality by applicant, the determination of the claimed annealing duration would have been obvious to one of ordinary skill in the art since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Sola 25 USPQ 433 (CCPA); In re Waite 77 USPQ 586 (CCPA).

Response to Arguments

3. Applicant's arguments filed 01/03/05 have been fully considered but they are not persuasive.

With respect to Okumura's reference, applicant in page 14 of the Remarks questions whether the motivation to combine can be found in the prior art. In response, the Examiner submits that the motivation to combine is clearly expressed in the reference. Column 8, lines 44-46 discloses that annealing in nitrogen atmosphere reduces the resistance of the Mg-doped p-type contact layer. Clearly, the p-type contact layer having low resistance would allow more holes injected from a p-type electrode into the active layer, hence increasing light output of a light emitting device (LED). One of ordinary skill in the art would readily recognize the benefit suggested by Okumura to employ Okumura's teaching in the process of Rennie so as to improve the performance of the LED device.

With respect to Rennie's reference, applicant argues that the Rennie patent does not involve an Mg-doped p-type layer and therefore for this disclosure of annealing it in a nitrogen gas atmosphere would not seem to apply to the GaN layer of the Rennie patent. The Examiner disagrees. Like the Okumura patent, Rennie patent also involves a treatment of a p-type GaN contact layer (see layer 9 in Fig. 7). As known in the art, a p-type GaN layer is obtained by doping the GaN layer with Mg, hence Rennie patent and Okumura patent are in the same field of endeavor. Applicant also argues that Rennie patent suggests that it obtains a near perfect ohmic contact and therefore there would be little motivation to modify its structure having such a stellar result. In response, it is noted that improving a near perfect ohmic contact does not mean there is no room to improve other aspect of the device so as to obtain optimum performance. A perfect ohmic contact with a high resistant contact layer does not guaranty high performance of the device because carrier mobility is hindered, whereas a perfect ohmic contact with a low resistant contact layer surely increases efficiencies of the device because the device can be operated by low voltage with high carrier conduction.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the

advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair->

Application/Control Number: 10/694,814
Art Unit: 2823

Page 7

direct.uspto.gov. Should you have questions on access to the Private PAIR system,
contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

03/20/05

A handwritten signature in black ink, appearing to read 'Trung Dang', written in a cursive style.